

JUL 7 1949

# The American **STATISTICIAN**

The news publication of the  
AMERICAN STATISTICAL ASSOCIATION

APRIL-MAY 1949  
Volume 3, No. 2

## THE COMMITTEE ON COMMITTEES

NEWS 2, 5, 20

THE INTERNATIONAL STATISTICAL INSTITUTE Stuart A. Rice 4

## THE DEVELOPMENT OF

### FEDERAL STATISTICAL COORINATION—Part I

Clem C. Linnonberg, Jr. 6

PERSPECTIVE FROM NEW YORK 11

## MEMORANDUM ON STATISTICS IN THE

FEDERAL GOVERNMENT—PART II John D. Tukey 12

COMMITTEES AND ASSOCIATION REPRESENTATIVES 17

QUESTIONS AND ANSWERS 18

AREA BIAS IN MAP PRESENTATION Kenneth W. Haemer 19

CHAPTER NOTES 21

NEWS ABOUT MEMBERS 22

25 CENTS

*Have you seen these Wiley books?*

## **PSYCHOLOGICAL STATISTICS**

By QUINN McNEMAR, Professor of Psychology, Statistics, and  
Education, Stanford University.

The emphasis in this book is on the understanding of fundamentals with special stress on underlying assumptions, permissible interpretations and inferences, and limitations. It is a concise, clearly-written introduction to statistical methods that provides

a continuous transition to more advanced topics. Except for factor analysis, all the techniques frequently used in psychological research are covered, and the situations where the techniques are applicable are specified.

A WILEY PUBLICATION IN PSYCHOLOGY

Herbert S. Langfeld, Advisory Editor

January 1949      364 pages      5 7/8 by 8 7/8      \$4.50

## **STOCHASTIC PROCESSES and COSMIC RADIATION**

By NIELS ARLEY, Assistant Professor of Physics  
Institute of Theoretical Physics, University of Copenhagen

This book investigates in detail the fluctuation problem of the theory of cosmic radiation. The book falls into two parts, one purely mathematical and the other dealing with physics. The first part treats of the theory of stochastic (random) processes.

The second part discusses in detail the fluctuation problem in the theory of the cosmic ray showers and the experimental material available for a quantitative comparison between theory and experiment.

February 1949      240 pages      illus.      5 7/8 by 9      \$5.00

## **INTRODUCTION to MATHEMATICAL STATISTICS**

By PAUL G. HOEL, Associate Professor of Mathematics,  
University of California at Los Angeles.

One of the WILEY STATISTICS SERIES

Walter A. Shewhart, Advisory Editor

1947      258 pages      illus.      23 tables      5 7/8 by 8 7/8      \$3.50

## **SEQUENTIAL ANALYSIS**

By ABRAHAM WALD, Professor of Mathematical Statistics,  
Columbia University.

One of the WILEY STATISTICS SERIES

Walter A. Shewhart, Advisory Editor

1947      212 pages      illus.      7 tables      6 by 9 1/4      \$4.00

**JOHN WILEY & SONS, Inc.**  
440 Fourth Avenue, New York 16, N. Y.

## The American STATISTICIAN

APRIL-MAY 1949, VOL. III, NO. 2

The news publication of the  
American Statistical Association

### OFFICERS

*President:* Simon Kuznets. *Directors:* C. H. Goulden, Isador Lubin, Lowell J. Reed, George W. Snedecor, Frederick F. Stephan, Willard L. Thorp, L. L. Thurstone, Samuel S. Wilks. *Vice-Presidents:* Dorothy S. Brady, H. A. Freeman, Lester S. Kellogg. *Secretary-Treasurer and Managing Editor of Publications:* Merrill M. Flood.

### EDITORIAL COMMITTEE

Sylvia Castleton Weyl, editor; Churchill Eisenhart, Morris Hansen, Samuel P. Hayes, Jr., Lester S. Kellogg, Julius Lieblein, Will Lissner, Marion M. Sandomire, John W. Tukey, Morris Ullman.

### Department Editors:

Questions and Answers  
Frederick Mosteller  
Presentation Problems  
Kenneth W. Haemer

*Correspondents:* Albany—David M. Schneider; Austin—Stella Traweck; Central New Jersey—Willard C. Thompson; Chicago—Jack R. Green; Cincinnati—Ellery F. Reed; Columbus—Rosemary Tague; Connecticut—J. H. Watkins; Cuba—Hugo Vivo; Philadelphia—Mary McDermott; New York—Milton Stevens; Washington, D. C.—Samuel Weiss. Government—Virginia T. Veneman. Latin America—Francisco de Abrisqueta. United Nations—F. Marguerite Nowak.

Entered as second class matter March 11, 1938, at the post office at Washington, D. C., under act of March 3, 1897. *The American Statistician* is published six times a year—February, April, June, August, October and December—by the American Statistical Association, Editorial Office: 1603 K Street, N. W., Washington 6, D. C. Subscription rate: one dollar and fifty cents a year or twenty-five cents per copy.

## THE COMMITTEE ON COMMITTEES

The new constitution of the American Statistical Association provides for a Committee on Committees whose duty it is to describe the functions of each of the committees of the Association and to make recommendations to the Board and the Council on the committee structure of the Association.

This committee is composed of Mrs. Aryness Joy Wickens, Chairman, Miss Helen M. Walker, Mr. Walter A. Shewhart, Mr. Robert W. Burgess, Dr. Joseph Berkson, and Mr. Henry Chauncey. It held its first meeting in New York City on April 10.

The most immediate task before the Committee is to describe more concretely the functions of sections of the Association now organized as Section Committees. At the present time there are three such sections—Biometrics, Training of Statisticians, and Business Statistics.

The Biometrics Section was formally established as a Section in 1938. It has its own journal (Biometrics), organizes a number of programs at each annual meeting, and makes nominations for its officers through its annual meeting. These officers are then, as a matter of custom, appointed for the Committee by the President of the Association. The present chairman of this Section is Dr. Margaret Merrell, of Johns Hopkins University.

A section on the Training of Statisticians was organized at the New York meeting in 1947 and was responsible for organizing a number of splendid sessions at the last annual meeting of the Association in Cleveland. The officers of this section for the current year are Mr. J. E. Morton of Cornell University, Chairman, and Mr. Sebastian Littauer, Secretary.

The most recently formed section is that on Business Statistics, organized at the annual meeting in Cleveland and approved by the Board and Council this year. Its chairman is Mr. Ralph J. Watkins of Dun and Bradstreet, Inc., of New York City.

The Committee on Committees has asked the advice of the members of these Section Committees with regard to the scope of their activities as a guide to the Committee on formulating a broad charter for all Sections of the Association. The Constitution provides that each of these Section Committees shall be represented on the Program Committee and shall have responsibility for planning special sessions at the annual meetings of the American Statistical Association. In addition, the Committee has asked specific advice on the following questions from each of the Section Committees: (1) How should the officers of the Sections be chosen? (2) What functions other than those provided in the Constitution should the Sections undertake? (For example, articles for the *Journal* and the *American Statistician*, special meetings outside the annual meetings, supplemental (printed or mimeographed) materials of interest to Section members in addition to those in the regular publications, etc.) (3) Definition of the scope of each Section.

The Committee on Committees is also considering whether there are other large groups in the Association who would be interested in specialized activities which could be undertaken by a Section Committee.

The Committee would appreciate having suggestions from the membership on any of these questions. Please address suggestions on the way in which existing Sections should be organized to the chairmen of those Sections. General suggestions should be sent to the Chairman of the Subcommittee on Sections, Mr. Robert W. Burgess, Chief Economist, Western Electric Company, Inc., 195 Broadway, New York.

# NEWS

**Samuel Weiss elected Secretary-Treasurer of ASA — Historical Statistics of the U. S. — Summer schools — statistical meetings — U. N. news — positions available**

## Council on Productivity

The Anglo-American Council on Productivity held its first meeting in London between October 25 and November 6, 1948. The Council was set up earlier in the year by agreement between Sir Stafford Cripps, Chancellor of the Exchequer, and Paul Hoffman, Administrator of the Economic Cooperative Administration. It consists of representatives of management and labor in each of the two countries, and was formed to discuss the means whereby United States industry might assist the British program for increasing productivity and to take such further steps as may be necessary to implement its conclusions.

The Council set up five committees. Perhaps the most important of these will make arrangements for a series of plant visits by British employees at various levels to appropriate factories in the United States. To initiate this venture in the spreading of know-how and techniques, several British teams will be brought to the United States in the coming quarter. After gaining experience with the organizational problems involved, the Council expects at a later time to schedule many production teams for visits during the life of the ECA program.

A second committee, of special interest to statisticians, has two functions. First, because the Council finds wide differences of opinion with respect to relative levels of productivity in the two countries, the committee is to examine the basis on which such calculations can be made and seek methods whereby these differences of opinion can be reconciled. Second, the Council believes that it is desirable to have available measures of trends in productivity in order to evaluate and stimulate progress, and so has initiated an examination into the preparation and use of productivity data in the two countries.

Other committees will study the availability of equipment and power in British industries, differences between the countries in specialization of production, and the methods used in each country to develop and disseminate economic information and to improve the level of general understanding concerning economic problems, particularly as they relate to productivity.

## Historical Statistics of the United States, 1789-1945

A statistical summary of American social and economic development since 1789, with figures for each year, was issued about May 1st by the U. S. Bureau of the Census. Entitled *Historical Statistics of the United States, 1789-1945*, the book is the promised historical supplement to the annual *Statistical Abstract of the United States* which, for 70 years, has been the official statistical yearbook of the United States. This volume was prepared with the cooperation of the Social Science Research Council.

The new historical volume provides government officials, businessmen, librarians, economists, teachers, and students with a statistical reference volume which brings together nearly 3,000 statistical time series of annual data, carried back to 1789 where possible. Broad subject fields covered are wealth and income; population characteristics, immigration, and naturalization; vital statistics, health, and nutrition; labor force, wages, hours, and working conditions; agriculture; land, forestry, and fisheries; minerals and power; construction and housing; manufacturers;

transportation (including railroad, shipping, roads, and air transport); prices; international balance of payments and foreign trade; banking and finance; government (including elections and politics, government employment, Federal finances, copyrights and patents, and State and local government finances). A special appendix contributed by the National Bureau of Economic Research provides monthly and quarterly figures, similarly carried back in time, for 30 statistical series which are recognized as useful indicators of business conditions.

The book provides data for immediate use and serves as a starting point and guide to original sources of data for those wishing greater detail, discussion, or explanation. The text provides definitions of terms and brief annotation, together with specific statements of sources.

While the volume was planned, assembled, and edited by the Statistical Abstract staff in the Bureau of the Census, statistics were provided by virtually all statistical agencies of government and many private organizations. The Social Science Research Council established the Committee on the Source Book of Historical Statistics, J. Frederic Dewhurst, Chairman, to advise with the Bureau of the Census in the planning and compilation. The project is the outgrowth of the work of the joint committee of the American Statistical Association and the American Economic Association, established in 1945 to explore a proposal made by J. Frederic Dewhurst of the Twentieth Century Fund.

The Committee on Research and Economic History of the Social Science Research Council contributed funds so that the Source Book Advisory Committee could appoint an executive secretary to work full-time with the Bureau of the Census on the project.

Orders are now being accepted by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. The price is \$2.50 (buckram).

## Population Experts to Meet

The International Union for the Scientific Study of Population will hold its first official Assembly since the war in Geneva, Switzerland, during the week of August 27-September 3, 1949.

The agenda of the Assembly will include provision for informal discussions on research problems in demography, and for official action on the progress of the Union. Two special sessions of the Assembly will be devoted, at the request of UNESCO, to the consideration of the cultural assimilation of immigrants as regards demographic aspects of this question and possible lines of research.

The Union was first organized in 1928. It was reconstituted, after the disruption of its activities by the war, at the time of the International Statistical Conferences in Washington, September 1947. Its aim is "to facilitate the progress of quantitative and qualitative demography as a science". Its present membership includes scholars from 31 countries. Membership in the Union is now on an individual basis, and candidates must be endorsed by five members.

Present elected officers are M. Adolphe Landry, President, and M. Georges Mauco, Secretary-General and Treasurer. These officers and seven vice-presidents constitute the Executive Committee. Vice-president Alfred J. Lotka represents the United States on this committee.

An administrative office of the Union was established for a two-year period in Washington in November 1948. Professor Frank Lorimer of the American University was appointed Administrative Director. Communications concerning Union affairs may be addressed to him at the American University, Washington 16, D. C.

## Samuel Weiss elected Secretary-Treasurer of ASA by Council



**SAMUEL WEISS**

The Council of the American Statistical Association announces with deep regret the resignation of Dr. Merrill M. Flood as Secretary-Treasurer of the Association. Dr.

Flood, who headed the administrative work of the Association since May 19 last, is now a member of the senior staff of the Rand Corporation at Santa Monica.

In accepting his resignation, the Council said: "We are all deeply appreciative of the untiring efforts that you devoted to your appointment as Executive Director and during the year of your service in the latter capacity. It is our hope that you will maintain your active interest in our Association, and continue to bring to it your experience in dealing with administrative problems and your active concern with the problems of statistical operation and research."

The Council has elected Samuel Weiss, Chief of the Division of Employment Statistics, Bureau of Labor Statistics, Department of Labor, as the Association's new Secretary-Treasurer. He is an expert in large-scale surveys and manpower problems and comes to direct the executive work of the national office after three years experience in professional association problems as Secretary of the ASA Washington Statistical Society.

For the past eleven years, he has been active in the statistical field, contributing papers on establishment sampling and employment statistics to ASA meetings and working persistently for a coordinated employment statistics program between state organizations and the Bureau of Labor Statistics.

During the war Mr. Weiss served as Chief of the Manpower Estimates Section and Reporting Section of the War Manpower Commission. Until recently, in addition to his other duties, Mr. Weiss has been lecturing at American University in the field of statistics.

### Summer seminar in Chicago

#### Research on communication and public opinion

A Research Seminar on Communication and Public Opinion is being sponsored by the Committee on Communication, the Departments of Political Science, Psychology, and Sociology, and the National Opinion Research Center. The Seminar will be held at the University of Chicago during the second term of the summer quarter, August 1 to September 3.

The seminar will deal with research problems in the formation of public opinion. It is being planned for a group of about thirty specially qualified students. The seminar program is composed of two main parts, one on substantive problems in the field and the other on technical problems. The former will include lectures and seminar meetings on the historical development of public opinion, the relation of the field to general social science problems, the role of such determinants in opinion formation as class position and personal characteristics, personality characteristics, group memberships and loyalties, and the communication media. The section on technical problems will deal with design and formulation, sampling and measurement, and analysis.

The seminar will be staffed by several visiting lecturers who have done notable work in the field. Among the participants in the seminar will be Hans Speier and Paul F. Lazarsfeld, visiting Professor of Sociology for the second term.

Persons interested in this program should write to Clyde Hart, Director, National Opinion Research Center, 4901 Ellis Avenue, Chicago, or Bernard Berelson, Chairman, Committee on Communications, University of Chicago.

### Finney to lecture at U. S. D. A. Graduate School

Professor David J. Finney, Lecturer in the Design and Analysis of Scientific Experiment, University of Oxford, will give three lectures on "Statistical Principles of Biological Assay" at the U. S. Department of Agriculture, Graduate School early in June. The lectures are sponsored by the Department of Mathematics and Statistics of the Graduate School.

The lectures will be given on Friday, Monday and Tuesday afternoons, on June 3, 6 and 7 from 4:00 to 5:30 p. m. in the Jefferson Memorial Auditorium, South Agriculture Building, Washington, D. C. The lectures are open to the public without charge.

### Institute Offers Statistics Summer School

The Institute of Statistics of the University of North Carolina announces summer sessions in statistical methodology, experiment design, biological assay, probability, variance, and sequential analysis. The Summer School will run from June 9 to July 19. Fuller information may be obtained from Box 168, Chapel Hill, North Carolina.

### Symposia on Numerical Analyses

Two symposia on effective utilization of automatic digital computing machinery will be held in Los Angeles this June under the National Bureau of Standards. The session on Construction and Application of Conformal Maps is tentatively scheduled for June 24-25, that on Probability Methods in Numerical Analysis for June 27-29.

# The International Statistical Institute

by STUART A. RICE

President

There are notable resemblances between the International Statistical Institute and the American Statistical Association. The Association started as a small statistical society in Boston and its membership was long confined to a few urban centers. It now is becoming a great and truly national organization. The Institute, an outgrowth of an earlier series of International Statistical Congresses, was long predominantly European in character but now is beginning to exemplify the world-wide connotations of its name. At ages 64 (the Institute) and 110 (the Association) both organizations display the dignity and prestige of maturity; yet quite recently both have markedly adapted themselves to changing environments, belieing predictions of demise or senility. Both are countering secessionist tendencies within their ranks and meeting competition from other younger, more specialized groups by developing federative roles and fostering specialization within their own organizations.<sup>1</sup>

There are also notable differences between the two organizations, quite apart from the conspicuous difference in territorial scope. It is often said that "anyone with eight dollars can join the Association." The Institute is limited to 300 ordinary and 30 honorary members, of whom no more than 35 of the former and 5 of the latter may be elected (by the existing membership) from any one state or confederation of states.<sup>2</sup> An earlier system of elections, though now somewhat simplified, remains sufficiently complicated to render admission slow, highly selective and uncertain.

The Institute's viability has been severely tested by crises that, fortunately, the Association has not been compelled to meet. Conspicuous among these have been two world wars that separated most members into rival military camps. Following the first World War, the resumption of biennial sessions was delayed but the Institute was able to reestablish with little change its traditional functions as a semiofficial agency for intergovernmental collaboration in statistics. It established or reactivated a variety of international commissions on problems of statistical comparability; it collected and published periodic international statistics; it drafted international conventions and secured their adoption by governments.

<sup>1</sup> Much credit must be given to the Association by the Institute for developing conceptions of organization that now underlie the constitutional framework of both. The Institute's new Statutes and the Association's new Constitution were drafted, discussed and adopted in about the same sequence of stages at about the same time.

<sup>2</sup> Until new Statutes were adopted in 1948, the respective membership totals were 225 and 25, the maxima for single countries being 25 and 5, respectively.

It was not the divisive influences of World War II that compelled the International Statistical Institute to abandon these functions following that conflict. Rather the reverse. Its biennial sessions have been resumed much earlier than during the twenties. The Institute's old functions have been lost because the efforts of the United Nations to introduce a new unity into human affairs brought with them new and enhanced official interests in statistics. The United Nations' Statistical Commission and Statistical Office, together with analogous instruments in the "specialized agencies" (e. g., FAO, the International Bank and Fund, etc.), have left no place of leadership in intergovernmental tasks for a voluntary statistical organization. This very fact, on the other hand, has increased the need for a voluntary international organization like the Institute to stand guard over the integrity of statistics and its varied professional and scientific interests.

This task of guardianship cannot and should not, however, be in the hands exclusively of any one organization. The growing specialization among statisticians would alone make this unrealistic. It seems clear, therefore, that the Institute's concern for professional and scientific standards in international statistics will be effective to the extent that it is able to bring about a coalescence of interests in such standards among statisticians everywhere, however organized. Hope for a "united front" on behalf of statistical standards in international affairs and the development of statistical science throughout the world underlies a number of new provisions in the Institute's Statutes which were approved by its first postwar General Assembly, meeting during the International Statistical Conferences in Washington in September 1947.

One of these provisions is an invitation to other international, regional and national statistical societies to collaborate together and with the Institute by applying for affiliation with the latter. A general acceptance of the invitation will thus give the Institute something of a "holding company" character. Decisions to affiliate with ISI have already been taken (in some cases subject to further ratification) by the executive committees or boards of the International Union for the Scientific Study of Population, the Econometric Society, the International Association for Research in Income and Wealth, the Biometric Society, the Inter American Statistical Institute, the Royal Statistical Society (UK), the Statistical Society of Paris, the German Statistical Society, the Brazilian Institute of Geography and Statistics and several other national statistical societies. The writer hopes that the American

Statistical Association may presently join this goodly and distinguished company of sister societies.

Other provisions of the Institute's statutes, provide for reciprocal representation in the discussion of questions of mutual interest by the governing bodies of the Institute and its international affiliates, for *ex officio* membership in the Institute by affiliates, for allocation of space in the Institute's publications to them, and for their participation in the development of the Institute's programs. The practical advantages of the joint planning of programs, looking toward facilitation of attendance at international meetings, was demonstrated at the 1947 sessions in Washington. The sessions of the international organizations named above, to be held in the late summer of 1949 in Europe, are all being planned with some degree of relationship to each other.

Other articles in the ISI Statutes provide for the organization of sections and committees on subjects of specialized statistical interest, in which non-Institute members may be enlisted. Another provides for the designation of the occupants of important national and international statistical positions as Institute members *ex officio*, during their official tenure. This device, borrowed from the experience of the Inter American Statistical Institute, is designed to keep ISI abreast of and responsive to official statistical activities throughout the world. As this is written, a first list of such positions has been presented for their vote to the members of the Institute's "Bureau" or Executive Committee.

The loss of the Institute's semiofficial role in inter-governmental affairs has not impaired its willingness to accept official requests for service or advice. Once again the parallel is apparent with the American Statistical Association and its frequent services to the

United States Government. A current illustration of such a service relationship is the contract recently entered into with the United Nations by the Director of the Institute's Permanent Office at The Hague for an analysis of the population of Ruanda Urundi.

Indeed, the Institute's most promising current enterprise — an international program for the extension of statistical education — has received the blessing of the UN Economic and Social Council and a preliminary grant of funds by UNESCO.

Not all of the problems which arise when a venerable society like the Institute seeks to reorient itself within a new international system can be described in a brief article. By no means all of these problems have been solved. Geographical isolation of the war-years and the isolation resulting from increased specialization have retarded the process of infusing "new blood" into the Institute's membership. The unusually large number of statisticians of the highest competence within the United States raises questions concerning the equitable distribution of memberships. Some 37 nations are now represented among the Institute's 204 members, the latter a figure which allows considerable room for the future correction of any existing inequities.

The writer does not believe in the maintenance of institutional forms for their own sake. Survival should result from utility. I believe that the Institute has met this test and survived its most difficult crises. It is entering upon a new and enlarged sphere of usefulness. Its services should contribute not only to the advancement of statistical science and administration, but also to the further development of international organization for the maintenance of peace. In pursuing these objectives, I hope that it may have as an associate and ally the American Statistical Association.

## NEWS CONTINUED

### Institute of Mathematical Statistics West Coast Meeting

Berkeley June 16-18, Tentative Program

Statistical problems arising from research in tuberculosis. Paul T. Bruyere, United States Public Health Service.

Some problems arising in plant breeding. Stanley W. Nash, University of California, Berkeley.

Additional papers will be announced later.

### The National Bureau of Standards announces research fellowships in mathematics

The Institute for Numerical Analysis of the National Bureau of Standards, located at the University of California, Los Angeles, offers a number of research fellowships during the summer of 1949, and the academic year 1949-1950, to qualified graduate students in mathematics and mathematical physics. Fellows must be enrolled in an accredited college or university. Research work performed at the Institute may be applied toward a thesis for an advanced academic degree.

Fellows will work at the Institute and will be expected to perform mathematical research aimed at methods for advancing the applications of high speed automatic digital

computing machinery. Individual work schedules may be arranged. Stipends will be based on full-time annual salaries of \$2,294 for master's degree candidates, and \$3,727 for doctoral candidates.

Inquiries and requests for application forms should be addressed to the Chief, Institute for Numerical Analysis, 405 Hilgard Avenue, Los Angeles 24, California.

### New Viennese quarterly

The first copies of the Statistical Quarterly (Statistische Vierteljahresschrift), published by Dr. Wilhelm Winkler at the University of Vienna, Institute of Statistics, have arrived in the United States. Information about the publication may be obtained by writing to Statistischen Vierteljahresschrift, Wien I, Rathausstrasse 19, Vienna, Austria.

A letter from Dr. Winkler, received by Dr. Francis Joseph Weiss of the Sugar Research Foundation, contains the following paragraph: "It will be of interest to you that I have formed here in Vienna a 'Statistical Research Committee' which will be the precursor of the Austrian Statistical Society." At the founding meeting on February 7th, 1949, 51 statisticians were present representing all branches of the theoretical and applied statistics: mathematicians, probability theoreticians, demographers, administrators, biologists, psychologists, agronomists, technologists, etc. It was a good beginning on which I shall proceed imperturbably making the best of it."

# The Development of Federal Statistical Coordination, 1908-1949

by CLEM C. LINNENBERG, Jr.\*  
Division of Statistical Standards  
U. S. Bureau of the Budget

## The aims of statistical coordination

Statistical work, like other Federal activities, has recently been appraised on behalf of the Hoover Commission—the Commission on Organization of the Executive Branch of the Government. Dr. Frederick C. Mills and Dr. Clarence D. Long, representing the National Bureau of Economic Research, and aided by a panel, have surveyed the Federal statistical services and reported to the Commission. The present article is an outgrowth of one of the reports which the Mills-Long group requested of Federal agencies as background. Because the National Bureau group was asked by the Commission to recommend where we go from here, and by what route, it wished to know where we are now and how we got here. This article attempts to sketch that development, so far as concerns the legal basis of statistical coordination.<sup>1</sup> The Mills-Long recommendations were not yet released when this article was written, although they have since been announced.

When people outside the Government speak of statistics, they are likely to think, first and foremost, of the "non-administrative" statistics of such offices as the Bureau of the Census, the Bureau of Labor Statistics, and the Bureau of Agricultural Economics. These agencies produce various types of data which are much in demand by trade associations, labor unions, research workers in universities and at foundations, and other private groups, as well as being used by the Government as a basis for arriving at policy. Within the Government, the word "statistics" promptly suggests not only non-administrative data but also "operating" (i.e., "administrative") data, the quantitative information which is gathered specifically in order to make administrative decisions, or which is a *by-product* of administering a program. Thus foreign price information is collected by the Department of State specifically as a basis for determining cost-of-living allowances for civilian personnel of the U. S. Government stationed abroad. An important example of by-product statistics is the wage-data developed in maintaining old-age insurance records. Administrative statistics are extensively used, inside and outside the Government, for purposes other than those which originally bring the data into being.

\*The views expressed in this article are not necessarily those of the agency.

<sup>1</sup> Articles in the American Statistician on related topics are Professor John W. Tukey's report, in the February and present issues, and Dr. Morris A. Copeland's "Authority and Reason as Instruments of Coordination in the United States," in the issue for June, 1948.

Thus in various ways the Government produces statistics to meet diverse but interrelated needs of the public, of Federal agencies, and of still other entities, such as the United Nations. Statistical coordination is the attempt at fashioning into a coherent whole these various activities, which arise in separate contexts.

This objective means many things, but an illustration or two will indicate its nature. Data collected or tabulated by one agency may serve the needs of a second agency, particularly if the needs of both are considered in advance, when the plans for gathering or processing the data are in the making. The Government can thus avoid duplicate tabulation (a needless burden on the taxpayers) or duplicate fact-gathering (a needless burden on both the taxpayers and the persons who fill out Federal forms). Another aim of coordination is comparability—for instance, between employment data from one agency and production data from another.

The statistics which the citizen asks the Government to supply to him are mainly compilations of facts initially furnished to the Government by the public. But the furnishing of facts to the Government is so widely regarded by the public as a nuisance that it should be kept at a minimum not only by avoidance of duplication but also by avoidance of any needless queries.

## What is our choice of routes?

What is our *choice of routes* to statistical coordination? First, there is the procedure under which each agency is allowed to gather and process the information needed for its own administrative operations, and even to collect and tabulate the *non-administrative* statistics which lie in its subject-matter field, except when either kind of data is available from another agency. (Thus the Public Health Service produces statistics regarding the work of the marine hospitals administered by it, and, independently of any *administrative* responsibility, compiles birth and death statistics concerning the nation's population.) At the same time, a central agency is set up for the specific task of coordinating all agencies' statistical work.

Another approach to statistical coordination would be to put a large amount of Federal fact-gathering into one bureau—e.g., to put into such a bureau all major activities for collecting and processing statistics of

types not directly linked to operations. This would be a first step, presumably to be followed by coordination in the broader sense: a continuing process, in which each new problem or project in one field or agency must be considered with respect to related ones in other fields or agencies, with reconsideration at frequent intervals. It is to be assumed that the central statistical bureau would not decide the content of its program independently of the needs of other bureaus and of the public. New needs constantly arise, and old needs change in character, become less important, or disappear altogether.

The sundry proposals for *Government-wide* statistical coordination which have appeared from time to time are variations upon these two ideas. Some proposals have drawn in part upon both ideas. In addition, there are coordinating measures of limited scope but nevertheless of value, such as relationships which two agencies arrive at by themselves, perhaps informally, for the utilization of each other's data of specified kinds, or for mutual consultation about particular statistical problems of common interest.

The choice of routes to statistical coordination, mentioned here only as background, is a complex topic which has received ampler discussion elsewhere. See, for example, "The Role and Management of the Federal Statistical System," by Dr. Stuart A. Rice (*American Political Science Review*, June, 1940, vol. 34, pp. 481-488), and "Centralization and Coordination of Federal Statistics," a report of the Bureau of the Budget (*Congressional Record*, December 11, 1945, vol. 91, pp. A5819-A5823).

### Bird's eye view

In 1908 President Theodore Roosevelt set up an Interdepartmental Statistical Committee, "under the jurisdiction of the Secretary of Commerce and Labor," for purposes of coordination and improvement which, to our ears, have a very familiar ring. The President himself designated the members—one each from ten agencies, including the Comptroller of the Currency as chairman. The committee seems to have lacked staff and authority and apparently had a short life. (Executive Order No. 937, September 10, 1908.)

During World War I, a Central Bureau of Planning and Statistics, under the War Industries Board, had a brief and active existence (1918-1919), assembling statistics, advising other statistical agencies, and serving as a clearing house of statistical information.

In 1922 the Bureau of Efficiency proposed, as a permanent office, a Bureau of Federal Statistics within which the "collection, tabulation, and dissemination of all non-administrative statistics" would have been "centralized, so far as practicable." The proposal was offered in part as a means of achieving "coordinated and unified statistics." (*Statistical Work, United States Government*, House Document No. 394, 67th

Congress, 2d Session, p. 5.) The Bureau was not established.

Since that time, the consensus has been that centralization of the statistical services is impractical but that a coordinating agency is necessary. Thus in the late 1930's these views appeared alike in the unpublished staff report on statistical coordination which was submitted to the President's Committee on Administrative Management, and in the Brookings Institution report to Senator Byrd's Select Committee on Investigation of Executive Agencies of the Government. (Senate Report No. 1275, 75th Congress, 1st Session, 1937, pp. 527-528.)

Although the early decades of this century saw sporadic efforts at Federal statistical coordination, continuous activity in the coordination of Federal statistics dates from 1931. The steps taken in the past 18 years have all been on the twin premises of decentralized operation and central coordination of statistical services. In this period, there has been an increasingly effective coordination of Federal statistical services, although the rate of betterment has varied. It is less easy to generalize about the nature of the organization, procedures, and legal foundation of this coordinating activity.

In the earlier half (1931-1940) of the period referred to, there was a succession of interdepartmental boards charged with statistical coordination. On each board, nearly all of the members had their chief jobs in the various Federal agencies engaged in the collection, processing, and analysis of reports and statistics, spending only a fraction of their time as members of the coordinating board, and being responsible to the respective heads of the agencies whose statistical work they were to coordinate. (Cf. "Report to the President of the United States by the Director of the Bureau of the Budget", fiscal year 1922, *sic*; page 2, first paragraph.)

In the latter half of the period under discussion, the task of statistical coordination has been conducted by a Budget Bureau division, headed by the Assistant Director of the Bureau of the Budget in Charge of Statistical Standards.

Since this article was written, President Truman has signed Executive Order 10033 (February 8, 1949), for coordinating the work of Federal agencies in providing statistics to the United Nations and other inter-governmental organizations. The most active coordinating role is given to the Bureau of the Budget, but with some functions placed in the Department of State and the National Advisory Council on International Monetary and Financial Problems. The Budget Bureau's functions under the order have been delegated to its Division of Statistical Standards (Budget Circular A-39; April 4, 1949), which, during World War II, administered the somewhat related Executive Order 9103.

## Federal Statistics Board, 1931-1933

In April, 1931, the Director of the Bureau of the Budget, acting "By direction of the President," issued Budget Circular No. 293, establishing the Federal Statistics Board, as a part of the Federal Coordinating Service. Presumably the Director was acting at least in part on the basis of the Budget and Accounting Act. (Public Law 13, June 10, 1921, Sec. 209. Cf. Executive Order No. 3578, November 8, 1921, Sec. 10.) The Board Chairman was to be designated by the Chief Coordinator (a subordinate of the Budget Director). Seven other agency heads were to designate one member each, and four were to designate two each—a total membership of 16, plus any temporary members whom, on an *ad hoc* basis, the Chief Coordinator was to ask additional agency heads to designate. Section 4 of the Circular declared:

It shall be the duty of the Federal Statistics Board to study the existing situation with regard to the collection, compilation, dissemination and utilization of statistics by agencies of the Federal Government and to make recommendations to the Chief Coordinator looking to the elimination of needless duplication in statistical work and the fullest possible utilization of statistical information collected and the personnel and facilities concerned therewith, as well as the most effective and economical means of procuring additional statistics for which there may be a reasonable demand.

This meant that the Board was to deal with a very broad area—statistics throughout the Federal Government. But it was given neither staff nor powers. The intent was good, but it is scarcely surprising that the Board did not achieve much. (See "Tenth Annual Report of the Director of the Bureau of the Budget to the President of the United States," for fiscal year 1931, page 23; and "First Annual Report of the Central Statistical Board", for calendar year 1934, page vii.)

## Central Statistical Board, 1933-1940

### *a. Operation under Executive Order in 1933-1935.*

In the summer of 1933 the Federal Statistics Board was abolished. Five of its members became members of a newly created Central Statistical Board, established in July by an Executive Order issued under a temporary law—the National Industrial Recovery Act. (Executive Order No. 6166, June 10, 1933, Sec. 17; Executive Order No. 6239, August 2, 1933; Executive Order No. 6225, July 27, 1933.) This board was intended "to formulate standards for and to effect coordination of the statistical services of the Federal Government incident to the purposes of that act." The Board was to consist (a) of seven members designated respectively by the Secretaries of Agriculture, Commerce, Labor, and the Interior, the Governor of the Federal Reserve Board (as he was then called), the National Industrial Recovery Administrator, and the Committee on Government Sta-

tistics and Information Services; and (b) of "such other members as the President may designate or the Board may invite from time to time for full or limited membership."

The Board was given a small secretariat and "the power to . . . advise upon all schedules of all Government agencies engaged in the primary collection of statistics required in carrying out the purposes of the National Industrial Recovery Act, to review plans for tabulation and classification of such statistics, and to promote the coordination and improvement of the statistical services involved." Being limited to N. I. R. A. matters, this Board was in theory not given as big an area as was the Federal Statistics Board. Like that earlier body, it had no definitive control over the matters with which it was to deal. However, a new and important principle was established: The agencies whose statistical work was to be appraised by the Board were *required to hear the Board's views in advance*, even if they then chose to act contrary to the Board's advice. On the whole, the new scheme was a marked advance over the Federal Statistics Board.

In May, 1934, a new Executive Order on statistical coordination was issued, amending in entirety that of July, 1933. (See Executive Order No. 6700, May 4, 1934; Executive Order No. 7003, April 8, 1935; and Executive Order No. 7076, June 15, 1935.) The order of 1934, provided that the Chairman of the Board be appointed by the President and modified the method of selection of Board members. The President was now to appoint the Board Chairman (but no other members), and the total membership was not to exceed 17.

The Board's scope of interest was broadened to cover both Federal and non-Federal "statistical services in the United States" which were useful to the recovery program. The Board was directed to ". . . plan and promote the improvement, development, and coordination of . . . [those services, and to] plan and promote economy and the elimination of duplication in such services." It was authorized to "undertake statistical activities of an experimental character . . ." but was forbidden to "engage in any other statistical services." The Board was authorized to investigate any statistical service within its scope, and to publish its conclusions and recommendations; but the investigating and the publicizing were permissible only if consented to by the agency conducting the statistical service involved. The Executive Order requested (but did not direct) that any Federal agency, on being asked by the Board, supply information concerning any existing or proposed statistical work of that agency.

### *b. Reorganization by Public Law 219 in 1935.*

Two years after the Central Statistical Board was established, it was reorganized by Congress and given a specific statutory mandate. This was accomplished

by Public Law 219 of July, 1935, "An act to create a Central Statistical Committee and a Central Statistical Board . . ." The Act set up the Committee and the Board " . . . to plan and promote the improvement, development, and coordination of, and the elimination of duplication in, statistical services carried on by or subject to the supervision of the Federal Government, and, so far as may be practicable, of other statistical services in the United States." (Sec. 1.)

The Committee was to consist of the Secretaries of Agriculture, Commerce, Labor, and the Treasury. (Sec. 2.) The Board was to be responsible in part to the Committee and in part to the President. The Board was to have no more than 14 members, including a Chairman to be appointed for an indeterminate period by the President, subject to confirmation by the Senate. The Chairman was to be "the chief executive officer of the Board" and, unless he had some other paid Federal position, was to receive a salary of \$10,000 per year. The remaining members were to be "selected in such manner as the President shall prescribe . . ." and at least 10 of them had to be "already in the service of the United States." This last sort of member was to receive no compensation from the Board, but members not holding paid Federal positions were to be allowed a per diem salary while attending Board meetings. All members were required to be "persons technically trained in statistics, economics, or public administration, known in their profession as of high standing and wide experience." (Sec. 3.) The Board was authorized to have a staff, subject to the civil-service laws. Appropriations were authorized, not to exceed a total of \$180,000 per year. (Sec. 4.)

The Board was to "investigate and make recommendations with respect to any existing or proposed statistical work carried on by an agency of, or subject to the supervision of, the Federal Government." (Sec. 5(a).) It was authorized to conduct such activities with regard to *non-Federal* statistical work in the United States "with the consent of the agency concerned." (Sec. 5(b).)

Subject to whatever rules the President or the Committee might prescribe, the Board was authorized to require from any Federal agency information concerning any existing or proposed statistical work of that agency, except that any confidentiality requirements laid down by law were to over-ride such a requirement by the Board. (Sec. 5(c).)

The Board was directed to "Plan and promote the economical operation of agencies engaged in statistical work and the elimination of unnecessary work both on the part of such agencies and on the part of persons called on by such agencies to furnish information . . ." (Sec. 5(d).) With the Committee's approval, the Board was authorized to prescribe regu-

lations to carry out the provisions of the act. (Sec. 7.)

This statute was another step forward and was admirable as far as it went. Its chief deficiencies were: (1) While it gave the Board a very comprehensive responsibility, the law gave the Board scarcely any authority at all. (2) The act referred to "statistical work"—a phrase which, in practice, leads to marked differences of opinion as to whether the coordinating agency is straying beyond its jurisdiction. As was noted above, much of the fact-gathering in the Federal Government is incidental to administration, rather than being a strictly separate activity. Administrative fact-gathering can be as bothersome to the public, as expensive to the taxpayer, and as desperately in need of coordination as can non-administrative fact-gathering. But the people connected with the administrative fact-gathering are disposed to assert that they are not engaged in "statistical work." (3) Perhaps the most serious shortcoming of the act of 1935 was its temporary character. It provided that it expire in 1940. (Sec. 9.) These deficiencies were nothing new. Such had also characterized the legal provisions regarding statistical coordination in the period 1933-1935.

The President decided that each of the following six agency heads was to designate one of his subordinates as a member of the Board under the act: the Secretaries of Agriculture, Commerce, Labor, the Interior, and the Treasury, and the Chairman of the Board of Governors of the Federal Reserve System. Each designated member was to serve at the pleasure of his appointing officer, but not for longer than 2 years unless re-designated. The Chairman and the six designated members were to elect seven members for two-year terms. Of the latter seven, at least four and no more than six were to be persons already in the Federal service. (Executive Order No. 7287, February 10, 1936.)

*c. Procedures Established by Regulation No. 1 in 1936.*

Statistical coordination, if it is to be effective, is a day-to-day piece of work, a continuing relationship between the statistical agencies and the coordinating agency. No matter how competent the people in either sort of agency, an element of the systematic is essential to keep the venture rolling.

One of the most tangible things with which a statistical coordinating agency can deal is the forms used in gathering data. In commenting upon proposed forms, the Central Statistical Board and its successor agency have never been mainly concerned with such matters as format, although due recognition has been given to those factors. The stress has been on such aspects as what information the forms are to gather, how relevant this information is to the purpose involved, the adequacy of the coverage, and—

looking beyond the collection phase—the nature of the proposed schemes of tabulation and analysis.

In November, 1936, acting under Public Law 219, the Central Statistical Committee issued Regulation No. 1. Every Federal agency was required to submit each of its "general questionnaires" to the Central Statistical Board for review prior to adoption, early enough to allow the C. S. B. at least two working days for review. "Questionnaire" was defined to mean "any form employed or to be employed by any agency of, or subject to the supervision of, the Federal Government, when such form incorporates a question or questions to be asked of several or many respondents or when such form provides for the original recording of answers to such question or questions." One of the distinguishing characteristics of a "general" questionnaire was that it was to be sent to 20 or more "respondents" (persons or organizations asked to respond). Other questionnaires were called "restricted" and were to be submitted for review on written request of the C. S. B. Chairman.

Each questionnaire submitted for review was to be accompanied by information as to its purposes, the type and approximate number of intended respondents, etc. In addition, on special request from the Board, the using agency was to submit to the "... Board for review ... [any] forms ... and other materials pertaining to the collection, tabulation, analysis, or publication of the data from said questionnaire ...". This arrangement and the arrangement concerning "restricted questionnaires" contrasted to the *automatic* requirement of submittal of "general questionnaires" for review.

With regard to *all* review, it remained true that the Board (ordinarily, the Board's staff) was assured merely of an advance opportunity to make comments, derived from its own knowledge or from consultation with other interested agencies. This advice still did not have to be heeded, but it still had to be heard. Public Law 219, like the Executive Orders preceding it, did not establish a central *control* agency for statistics, but it gave Congressional blessing to a central office for technical advice.

#### *d. Transfer to the Bureau of the Budget, 1939.*

The next important step in the evolution of the Central Statistical Board came as an indirect result of the *Report of the President's Committee on Administrative Management*. The task set for this Committee was somewhat analogous to that of the Hoover Commission. The Committee's published *Report* (1937) said nothing of statistical coordination, but it did lead to the Reorganization Act of 1939, which conferred broad powers upon the President to consolidate, abolish, and establish agencies. The President's Reorganization Plan No. 1, which took effect on July 1, 1939, shifted the Bureau of the Budget

from the Treasury Department into the Executive Office of the President and provided further—

Sec. 2. The Central Statistical Board and all of its functions and personnel (including the Chairman and the members of the Board) are hereby transferred to the Bureau of the Budget . . . The Chairman of the Board shall perform such administrative duties as the Director of the Bureau of the Budget shall direct.

Sec. 3. The Central Statistical Committee is hereby abolished, and its functions are transferred to the Director of the Bureau of the Budget . . . (53 Stat. 1423.)

In September of the same year, the President issued an order "Establishing the Divisions of the Executive Office of the President and Defining Their Functions and Duties." (Executive Order No. 8248, September 8, 1939. Presumably the order was based upon the provisions of the U. S. Constitution vesting all executive power in him and requiring him to "take care that the laws be faithfully executed"; Article II, Secs. 1 and 3.) The part of the order having primary interest to the Central Statistical Board was a provision that the Budget Bureau was to plan and promote "the improvement, development, and coordination of Federal and other statistical services"; Sec. II-2 (g).

Regulation No. 1 continued in effect. The Budget Director soon supplemented it by prescribing a quarterly reporting system, to enable the Central Statistical Board to keep informed as to what forms were actually in current use by Federal agencies in obtaining information. (Budget Circular No. 351, November 1, 1939.) For each quarter-year, every agency was to supply the Board with a list of forms newly adopted, those revised, and those discontinued. As a step toward more adequate focussing of statistical responsibility *within* agencies, it was required that each of them designate, for the whole agency or for each part of it, a person who would be responsible for making these quarterly reports.

When the Board and its staff were brought into the Budget Bureau, they were not immediately called a *division* of the Bureau, but they did immediately acquire the *status* of a division, and the Board Chairman was given the same responsibility to the Bureau Director as was had by the chiefs of divisions. Within the first year after the C. S. B.'s staff came into the Budget Bureau, it came to be designated by the Bureau as the Division of Statistical Standards.

In July, 1940, Public Law 219 would expire and the Central Statistical Board would cease to exist. But, as has been indicated above, an alternative statutory basis for statistical coordination had existed all along, and indeed had actually been used, in 1931-1933, when the Federal Statistics Board had had its fling. Hence there would still be an available legal basis for statistical coordination, even after July, 1940.

#### *e. Procedures Established by Budget Circular No. 360 in 1940.*

As early as June, 1940, while Public 219 was still

in effect and the Central Statistical Board still existed, the Director of the Bureau of the Budget issued Budget Circular No. 360, acting "By direction of the President." This superseded Regulation No. 1 of the Central Statistical Committee and was based upon the Budget and Accounting Act, which provides:

Sec. 213. Under such regulations as the President may prescribe, (1) every department and establishment shall furnish to the [Budget] Bureau such information as the Bureau may from time to time require, and (2) the Director and the Assistant Director, or any employee of the Bureau when duly authorized, shall, for the purpose of securing such information, have access to, and the right to examine, any books, documents, papers, or records of any such department or establishment.

For a rule similar to Regulation No. 1 of the Central Statistical Committee, either the foregoing section or Executive Order No. 8248 would presumably have been an adequate foundation, since the only compulsion involved in such a rule is that of furnishing information to a central agency about an existing or proposed statistical activity. Circular No. 360 was this type of regulation, and declared:

Effective at once, in order to plan and promote the improvement, development and coordination of Federal report-collecting and statistical services, copies of all report forms, regulations, and other materials pertaining to the collection and compilation of information by or under the authority of any Federal agency, including such additional data as may be required in connection therewith, shall be submitted to the Bureau of the Budget for review . . .

## Perspective from NEW YORK

by MILT STEVENS

Many interesting meetings took place in New York during the past two months. The Social Statistics Division held the first of its bi-annual 1949 forums on INDEXES TO HEALTH.

A large group gathered to hear Dr. W. Thurber Fales, Professor at the College of Medicine, Johns Hopkins University, talk on "Indexes to Health of the Nation and Local Populations," and Dr. Irving Tabershaw, Professor at the College of Physicians and Surgeons, Columbia University, speak about "Absenteeism As An Index To Health of Employees." Dr. Wilson G. Smillie, of Cornell University Medical College, was chairman of a distinguished group of panel participants. The group explored the need for setting up a measurement of health through statistical indexes. It was urged that health indexes be introduced in this country which could be made a basis for comparison with indexes in other countries throughout the world. There was considerable discussion as to the advisability of having a composite index of health similar in some respects to the Consumers' Price Index, which would at a glance give an indication of the health of a country. Those persons who are concerned with administering health programs, however, felt that such an index would not give them the necessary information they needed to carry out a program for the prevention and control of specific diseases. The discussion brought out the importance of raw data in addition to the unusually published composite indexes with regard to the incidence of disease in administering a health program. A need was also expressed for more data on chronic diseases, which ordinarily get inadequate coverage in statistical reporting by health agencies.

In practice, review was by the Division of Statistical Standards.

Circular No. 360 defined "report form" broadly, including both administrative and non-administrative devices for getting information, orally or in writing. At least two working days before a report form was adopted, or substantially revised, or used for a new purpose, it was to be submitted to the Bureau of the Budget for review, together with specified information about the proposal. The same requirement was laid down for new or revised regulations governing the furnishing of information to the Federal Government or the maintenance of records from which information might be furnished to it.

While report forms and regulations were to be submitted to the Budget Bureau without being individually requested by it, the plan for *tabulation, analysis, or publication* of information collected by means of a report form was to be submitted for review on written request from the Budget Bureau. This contrast between an *automatic* requirement of submitting certain matters for review and a requirement of submitting certain others only *on request* was carried over from Regulation No. 1. Furthermore, as in that rule, submittal for review was compulsory but acceptance of recommendations of the statistical coordinating body was optional.

(To be concluded in the June issue)

The Statistical Techniques Group held their regular monthly meetings, again with large attendance and well known speakers.

In a talk on the "Design of Sample on Business," Lester R. Frankel, statistician of Dun & Bradstreet, emphasized the need for modifications in design when basic resources are limited. An example forcefully illustrated the point of the talk. Mr. Frankel outlined the sample design in an ideal situation when all resources are available. Departing from that point, he showed the restrictions that had to be imposed when there were limitations in the size and location of the field staff. There are many other factors which have an important bearing on sample design. Important among these is the availability and inadequacy of lists covering the entire industry under study. Another limitation can be created by the size of individual companies in the industry and their regional concentrations or dispersions. One last consideration dealt with unique problems and characteristics of the companies. Each of these individually had an extensive effect on the final design.

The February session was held jointly with the Metropolitan Section of the American Society for Quality Control.

Relatively little attention has been given to inspection through the use of variables, according to Dr. Harry G. Romig, Statistician of the Bell Telephone Laboratories. The emphasis of the majority of the sampling inspection plans is on attribute analysis (defective vs non-defective nature of each tested unit). Consequently operating techniques have developed almost entirely as an outgrowth of the general probability theory of attributes. Besides, it is more costly to obtain basic data for variable inspection even though such statistics yield more information per unit than attribute data. Dr. Romig mentioned several types of analyses where variable inspection has a greater overall efficiency than attribute inspection. One such instance is Process Control. In the talk, examples were shown where control charts and other statistical devices developed in attribute inspection had application to variable inspection.

CREDITS: Samuel Lutzker reported the activities of the Social Statistics Division. Lester Frankel covered the meetings of the Statistical Techniques Division.

# Memorandum on Statistics in the Federal Government

PART II, CHAPTERS V-VII

By JOHN W. TUKEY

## V

### The Research Function

#### 27. In general

One source of efficiency in reporting, analysis, and consultation is research. The science and art of statistics has only begun its development. There are many new things to come, and they will lead to greater efficiency, and to the ability to do things which today are impossible, just as today we do things blithely which were impossible yesterday. The investment in statistical research is a long-term one, but it has paid great dividends in the past. We can confidently look forward to good dividends from research investment today or tomorrow.

The statistical research that has gone on in government is a real credit to all concerned, as is emphasized by the 40-50 foreign students now working in and with government agencies to learn the resulting techniques. However, many of the improvements in statistical methods and the government statistical program have been based on research conducted without government support or encouragement. Such unsupported and unencouraged research will continue, but not in enough quantity to supply the government statistical program with adequate tools for learning more with less money. The government has many special needs, and these will often be slighted unless research is encouraged, not only on topics of obvious importance, but also in the general fields of government interest. The most pressing needs are often not recognized until the cure is at hand.

The one essential for statistical research is the right men with time to think and stimulation from actual problems. The organizational situation makes relatively little difference.

#### 28. Workers

When you ask "Who does statistical research?" you find no single answer. And essentially no one who does research does nothing else. There are many reasons for this, but the best is the need of good research for stimulation by contact. This may be a teacher's contact with students, a consultant's contact with other people's problems, or an analyst's contact with his own problems. But in any case this contact has proved to be an essential for good statistical research. Conse-

quently, statistical research in the government will be carried out by men who do other things too. The other things need not predominate—75% research and 25% consultation is a reasonable extreme, as is 5% research and 95% consultation.

Statisticians whose only function is reporting will do research very rarely. When one does some research, he should be considered for use in analysis and consultation.

Few analysts will do research; those who do should be considered for part-time service, at least, as consultants or researchers into analytical methods.

Consultants will usually do some research though it may be simple and take up only a small part of their time. If they wish to do more, and can effectively, they should be encouraged. For research will make them better consultants through the years.

General consultants must do research, for they are the storehouses of up-to-date knowledge. Only helping to create new knowledge will keep them up-to-date and out of a rut.

For similar reasons, government statisticians should be encouraged to do some statistical teaching. In the present state of statistics, satisfactory teaching must involve research into the organization of the material and into its logical structure.

#### RECOMMENDATION 16

(i) Statistical research in the federal government should always be combined with other functions, usually including consultation.

(ii) All government statisticians should be encouraged to undertake research and teaching in statistics.

#### 29. Support for outside research

The federal government has supported research and development in statistical method, and it is to be hoped that such support will continue. Such contract work, on wisely chosen projects, is a good investment and an anchor to windward. But this is not enough support and encouragement.

The federal government can also encourage research in other ways, inexpensively and efficiently. It can call in outside teachers and research men to give courses to government employees. The additional skill of these employees will be worth the cost. The bonus comes in the knowledge and understanding of government problems which the lecturer will take away. This will tend to color the research of the lecturer and his students, it will tend to increase the production of results of value to the government.

Second, the government can take in advanced students on temporary appointment, to learn about government statistical problems. Some of these students will return to government work, and in the face of present and near-future personnel shortages, this will pay for the small losses of efficiency from such a program. The bonus will come, again, in the increased knowledge and understanding of the students who do not come back, but who go on to research and the supervision of research.

RECOMMENDATION 17. Procedures for bringing into the government

- (i) lecturers for short in-service courses
- (ii) students for work experience

should be improved and expanded.

Third, the government can send select personnel for advanced study in research centers. This is partially covered by recommendation 18.

## VI Personnel

### 30. Supply and demand

The market for highly trained professional statisticians is a seller's market. The seriousness of the training problem has been emphasized by the recent report of the National Research Council Committee on Applied Mathematical Statistics ("Personnel and Training Problems Created by the Recent Growth of Applied Statistics in the United States". Reprint and Circular Series No. 128, May 1947). In the present writer's opinion the shortage, particularly of potential consultants, will be worse five years from now than it is today. After that it may get better, but in 1960 there will almost certainly still be a serious shortage.

For one thing, this means that the federal government will have to spread professional statisticians thinner than it would wish, thinner than would be most efficient. It must take care to use the technical training of those it has to the utmost, relieving them of administrative and numerical detail by providing administrative assistants and highly skilled computers wherever useful. This is a bare matter of economizing the use of the small amount of a rare skill which you can get.

On the other hand, the government will have to bid somehow for these men in competition with industry, business and education. A raw Ph. D. in statistics can command a much better salary in industry, business or a college than can a raw Ph. D. in chemistry, mathematics or physics. If it is not going to be possible to meet a substantial part of this differential by giving higher P-ratings to raw Ph. D.'s in statistics, then the government will have to look around for other ways to make its jobs attractive. More assistance, more important problems, more attention paid to opinions are all legitimate parts of the total "pay" as is comfort of

the chair, the relative privacy of office, and expenses paid to more professional meetings. Just as the unions are satisfied through "fringe demands" when wage raises are against policy, so the government may have to retain its professional statisticians through "fringe increases".

### 31. Problems with impractical solutions

More than one individual member of ASA commented on the need for removing inefficient statisticians from the statistical program. This could perhaps be done by transfer to the jobs of other sorts for which these men are highly competent—if there were enough trained statisticians.

A point which bothers those in the government service is the effect of pulsations in government activities. Things are busy, personnel is hard to get, both in government and out, so the agency takes what it can get—the work must go on. Next work contracts, good men are available, but the poor ones who came in during the bulge are there *with seniority*. It seems hard to do anything reasonable about this.

Such problems are particularly prominent in a new field like statistics, where the younger men with more recent training (and less seniority!) are likely to be more useful than the older ones. (After all, it was the young men of the Radiation Laboratory and their radars that the German General Staff credited with a great part in the defeat of Germany. Like statistics, ultra-high frequency electronics was and is a rapidly growing subject.) One way of approaching this sort of problem has been suggested to me, and that so vaguely as to make it only worth putting down for the record. It was pointed out that the grading system of Civil Service only takes account of what a man has done, and not of what he could do. If what he could do could be measured and used, this would help greatly in giving these younger men with modern training a fair rating. Because of the diversity and novelty of statistical work, particularly consultation, the "ability to do it" is relatively much more used than is "experience in doing it". Knowledge may not have come through formal education or listable work experience.

Another possibility comes from the very fact that the government must spread statisticians thinner than it desires. There will be, particularly in times of expansion, many jobs which statisticians could do better but where others must serve. If the effects of a general change in government personnel could be mitigated by the shifting of statisticians into such jobs during contraction and out of them during expansion, it might be possible to hold more trained statistical personnel in the government. It might be difficult to do this in a way to improve the efficiency of the government as a whole, although it would undoubtedly enhance the efficiency of the statistical program, since such a policy might have an unfavorable effect on morale in other fields of specialization. It seems worthy of consideration, however.

### 32. In-service training

With an extreme shortage of trained personnel, the federal government must continue to encourage and expand the further training of its present employees. To do this well will require expansion of present methods rather than introduction of new ones. In particular, the extension to many agencies of methods now in use by a few may be desirable.

The value of in-service courses on government time was mentioned in passing in the last chapter. This device should be used wherever it can be justified. It will apply particularly to the further training of groups now working on reporting and analysis.

It is unlikely that a group of consultants of suitable size will need a specific in-service course, but if they do, it should by all means be given. The interests of training and refreshing consultants would be greatly served by a weekly or fortnightly technical seminar held by each group of general consultants. The government would profit by any consultant attending such seminars during working hours.

In many agencies there is enough statistical activity to make local seminars at a less technical level very valuable. These seminars should be conducted by local consultants for analysts and reporting statisticians.

The evening courses available in Washington, through the colleges, and particularly through the Department of Agriculture Graduate School and its recent parallels, have been of great service in training the present statistical staff. This work deserves whatever encouragement that can be given, by urging individuals to attend and by recognizing the value of the training through rank and choice of positions.

For personnel in field offices, the problem is more difficult, but some things can be done. In placing field offices, the availability of evening courses should be given due weight. Since there will be many offices where adequate evening instruction is not available, the departmental graduate schools should consider the possibility of offering correspondence courses. The recent progress in group psychiatry suggests that groups of three or more meeting together might make such correspondence work much more effective than it is for individuals. Such experiments should be encouraged, since the time spent in preparing printed material will help to train the lecturer or lecturers.

It is possible for some agencies to "send their personnel to school", directly in a few cases, and indirectly by assignment to projects under way at educational institutions in others. This type of training should be extended to other agencies wherever feasible.

**RECOMMENDATION 18.** Training of government employees by in-service training, technical seminars, evening courses, correspondence courses, and detached assignment should be encouraged and increased.

### 33. Placement in the service

Given a statistician who is willing to work for the federal government (this is an abstraction, for he is generally willing only to accept one or more specific jobs) where should he work for maximum efficiency? Where as between agencies will depend on work load and present personnel, and clearly cannot be discussed here. Where as between functions is a reasonably general question and seems worth some attention as a matter of principle, although it may not be possible to put many of the conclusions into practice.

If a man has the broad background in theory and practice which qualifies him as a consultant, he should be used as one. These are key positions for the spread of statistical knowledge and methods. The choice between general consulting and local consulting should depend on further personal characteristics. For effective local consultation there must be patience and diplomacy, in an amount depending on the situation in the agency. In the other direction, the man with real research ability will be more effective as a general consultant, dealing with a broader class of problems.

Those whose natural bent is away from consultation, or whose training and background is not yet sufficient to make them consultants, are going to do reporting or analysis. The tendency here will be to favor analysis for those with background and interests outside statistics and to favor reporting for those who are narrowly statisticians, particularly of a routine type. The highest demand on a reporting statistician is often subject-matter knowledge, rather than statistical ability.

The government will need a higher percentage of professional statisticians in all these functions as time goes on. In reporting and analysis this trained core will have to be supplemented by a wider and wider fringe of more or less statistically trained personnel.

## VII

### Assessment and Evaluation

#### 34. The need

A large part, physically, of the statistical program is reporting and analysis, whose purpose is to supply information on how operations have gone on and what the effect of future operations is likely to be. There is an old Latin tag, familiar to the readers of Rudyard Kipling's *Stalky and Co.* "Quis custodiat custodes ipsos?" In the present case this can be twisted into the pertinent question "Who watches the operations of the control section?" In a simple industrial organization with concentrated management this problem is real but somewhat minor. The reporting information goes to one place and can be cross-checked in various ways. The analyses can be checked against results and discrepancies related to external influences—such as general business activity—or clearly counted as errors.

In the federal government the situation is far more complex, and the problem of controlling control is far

more serious. The results of reporting and analysis go to a widely distributed management. This widely distributed management is often unable to cross-check reporting information and frequently does not understand how to adequately analyze numerical information subject to error. Where, then, is the control of government statistical operations?

If these operations are to serve their purpose, the resulting numbers must have the confidence of the users. There are a few instances where the trained user has found reason for serious lack of confidence in government statistics. For three examples see an article by the late Leonard P. Ayres, a fellow of the American Statistical Association, in the *Cleveland Trust Company Business Bulletin* of April 15, 1946.

Such occasions for loss of confidence are important for the whole government statistical program, whose efficiency as a basis for decision they undermine tremendously. To keep the efficiency up it is necessary to do everything possible to avoid bias, lack of clarity of description and unduly large errors in government statistics. There must be control of the control operations.

### 35. Committees

There are already in existence more or less formal committees on parts of government statistics of interest to particular users. Some of these are on narrow fields of subject matter, others are agency-wide. These committees have a useful function, and it would be a mistake to even consider reducing their effectiveness. They are part of the operations, a significant part, and they are thereby not fitted to control these operations. They should be encouraged to fulfill their present functions, but not to take on mixed functions.

### 36. Boards of Review

Any system of assessing the operations of the government statistical program on a continuing basis should represent all the various users of government statistics as well as possible. These can be put into three broad classes with some justice: users in the federal government, organized users (in state and local governments, business, industry, labor, farmers, etc.) and unorganized users. A good board of review must represent all three groups. It is easy to obtain representation for the first two groups. Who can represent the unorganized user? The only organizations which could begin to represent such users are the professional societies of statisticians—and in this case this means the American Statistical Association—and in some cases organizations of subject matter specialists as well. Not too well, but better than any other groups, they could appoint members to a tripartite board of review to represent the unrepresented and serve as neutral experts.

Now any attempt to set up only one board of review would be hopeless, for there is too much government statistics for one group to consider in detail. This means that an adequate system is going to be complex, and as a consequence it must be set up slowly and

experimentally. The first steps are a practical matter, and require detailed knowledge which the writer does not possess. The long range aim can be discussed from general principles.

The scope of the individual boards of review, seemingly, must be fixed in terms of subject matter, no matter by what agencies this subject matter is covered. This will mean a steady influence toward the reduction of duplication and gaps and the promotion of efficiency in this respect. This will require the central index of government statistics recommended above. Otherwise the board of review cannot be sure of covering its field.

Even with a reasonable number of boards of review, there will be too many series for complete coverage. Beyond examining an annotated list of all series in their field, the board will not be able to discuss all series. Some sort of a stratified sampling plan, where the chance of careful discussion of any series depends on its scope and importance, seems indicated.

The boards of review will not be large groups, since they are supposed to do some work. Before their findings are formalized, they should be brought before the body of the profession (s) for discussion, at some such occasion as the annual meeting of the professional society (or societies). After the board of review has considered the points brought out in the discussion and revised its findings where it has been convinced, it would then be appropriate for the findings to be published.

The membership of these boards will naturally include subject matter specialists as well as professional statisticians, but it will usually be desirable to have statisticians, with or without interest in the particular subject matter, in the majority.

Any program of this sort will require financial support. The representatives of government and of organized users will naturally be supported by their employers and offer no problem. It seems appropriate to the writer that the government pay expenses, at least, for the third group of members. This can be fairly permitted, since their nomination is outside government control. It would further seem appropriate to have the results published at government expense. The whole procedure is designed to improve the effectiveness and efficiency of the government statistical program and is an appropriate activity for government support.

For the present, such boards would probably confine themselves to reporting information, although their inevitable discussions of what series to obtain will bring them into analysis to some extent. If such a system shall, at some future time, have been set up and have worked satisfactorily for some time, it may be wise to begin to have boards of review for analysis and even a general board of review to coordinate the individual boards. Then we would be approaching the statistical millennium!

RECOMMENDATION 19. Tripartite boards of review should be set up on an experimental basis in two or three fields of government statistics.

### 37. Administration

The problems of the administration of statistical groups and agencies and of the relation of statisticians and administrators are of central importance to the effectiveness of any statistical program.

The administration of a statistical group or agency is an administrative function and not a statistical one. The first and primary essential for such a job is administrative ability. Statistical training, knowledge and ability are entirely secondary. As in any technical administrative position, belief in the value of the work and ability to distinguish degrees of technical competence come just behind general administrative ability as prime essentials. These qualities are often possessed by statisticians, but more often by good administrators without statistical background. Given two equally good administrators, both with these other qualities to an equal degree, the one with the most statistical training is surely much to be preferred. Usually, however, the choice will be determined by administrative qualities.

Next, the relation of the statistician to the administrator concerned with operation. The efficiency of the operations, and the value of the statistician's contribution, depends on how thoroughly the administrator understands the functions of statistics and their importance to his job of management. The only reasonable ways of educating administrators about statistics and its possible service to them seem to be those now in use. First, the administrator who has a good statistician on his staff will learn by argument, memorandum and example. Second, the administrator who works for, or sometimes with, an appreciative administrator, will be directed or led into using statistics at more nearly its full potentialities. When other ways are found to supplement these two, they should be adopted.

38. RECOMMENDATIONS. While the various recommendations are likely to be clear when read in context, a short form of each is given below for convenience in reference. These recommendations are all intended to promote the efficiency of the federal statistical program.

1. *Timeliness.* (Feb. p. 11) Study should be given to increasing the timeliness of various federal statistical series by

- (i) greater use of sampling,
- (ii) a further study of forecasting from early returns,
- (iii) more frequent issuance of early tentative figures,
- (iv) issuing a weekly bulletin of advance statistical releases.

2. *Presidential group.* (Feb. p. 12) The President should be provided with a small professional group to furnish reporting and analytic information.

3. *Congressional group.* (Feb. p. 12) The Congress should be provided with a small professional group to furnish reporting and analytic information.

4. *Descriptions.* (Feb. p. 12) All government statistical releases should be accompanied by accurate and clear descriptions of what is measured or counted.

5. *Central index.* (Feb. p. 13) A centralized index and open library of government statistical information should be set up.

6. *Overlapping with states.* (Feb. p. 13) Committees should be set up to examine overlapping in 3 selected areas.

7. *Trade associations.* (Feb. p. 13) The gathering of "complete" information by trade associations, supplemented by government sample surveys should be considered.

8. *Professional societies.* (Feb. p. 13) The government should continue to encourage participation in professional societies.

9. *Neutral experts.* (Feb. p. 13) Neutral experts on joint committees should be appointed by professional societies.

10. *Interpretation.* (Feb. p. 14) Government statistical reports may appropriately supplement numerical information with interpretation whenever the principles of interpretation and the underlying numerical information are clearly presented.

11. *Recognition of analysts.* (Feb. p. 14) Civil Service should recognize the technical skill and responsibility of analysts, whether statisticians or not, as a substitute for administrative responsibility.

12. *Analytical groups.* (Feb. p. 14) The number and scope of the small, highly professional analytical groups in the federal government should be increased.

13. *Citizen Information.* (Feb. p. 15) Citizens should be furnished numerical information on economic matters in easily understandable terms.

14. *Consultants.* (Feb. p. 17) Consultants should be dispersed through the various agencies, and these local consultants should be supported by two or three groups of general consultants.

15. *Cognizance.* (Feb. p. 17) Local consultants should have authority to enter and comment on problems.

16. *Research.* (p. 12) Statistical research in the federal government should always be combined with other functions, notably consulting. Government statisticians should be encouraged to undertake research and teaching.

17. *Contact.* (p. 13) Procedures for bringing in lecturers for in-service courses and students for work experience should be improved and expanded.

18. *Training.* (p. 14) Further training of government employees by all methods should be encouraged and increased.

19. *Boards of Review.* (p. 16) Tripartite boards of review should be set up on an experimental basis in two or three fields of government statistics.

# Committees and Association Representatives for 1949

## COMMITTEES

### Fellows

Harold Hotelling, Chairman  
Henry B. Arthur  
W. Edwards Deming  
Lester S. Kellogg  
George W. Snedecor

### Committee on Committees

Aryness J. Wickens, Chairman  
Joseph Berkson  
R. W. Burgess  
Henry Chauncey  
Walter A. Shewhart  
Helen M. Walker

### Committee on Elections

Samuel S. Wilks, Chairman  
Joseph S. Davis  
A. N. Watson

### Commission on Statistical Standards and Organization

Isador Lubin, Chairman  
Frederick E. Croxton  
Frank W. Notestein  
Lowell J. Reed  
Walter A. Shewhart  
S. A. Stouffer  
S. S. Wilks

### 1949 Annual Meeting Program

Harold A. Freeman, Chairman  
Ernest E. Blanche  
Dorothy S. Brady  
Waite S. Brush  
Merrill M. Flood  
Howard Whipple Green  
Kenneth W. Haemer  
Lester S. Kellogg  
Simon Kuznets  
Isador Lubin  
Margaret Merrell  
Geoffrey Moore  
J. E. Morton  
Paul Olmstead  
George W. Snedecor  
Dorothy S. Thomas  
John W. Tukey  
Ralph J. Watkins  
Samuel S. Wilks

### Finance

Samuel Weiss, Chairman  
Robert Nathan  
Donald B. Woodward

### Publications

W. G. Cochran  
Gertrude M. Cox  
Merrill M. Flood  
Lester S. Kellogg  
Oscar Kempthorne  
Mortimer Spiegelman  
Sylvia C. Weyl

### Graphic Presentation

Kenneth W. Haemer, Chairman  
H. C. Barton, Jr.  
Clarence E. Batschelet  
John D. East  
Harriet Edmunds  
Frank W. Hubbard  
Ralph G. Hurlin  
Frank Jahrling  
William A. Neiswanger  
David M. Schneider

### Census Enumeration Areas

Howard W. Green, Chairman  
Clarence E. Batschelet  
W. Thurber Fales  
Shirley K. Hart  
Philip M. Hauser  
Lyman L. Hill  
O. A. Lemieux  
Leon E. Truesdell

### Joint Committee on Occupational Classification

Gladys L. Palmer, Chairman  
Meredith B. Givens  
Carl A. Heinz  
Reuben Horchow  
Harry Ober  
D. George Price  
Leon E. Truesdell  
Emmett Welch

### Census Advisory Committee

W. F. Ogburn, Chairman  
Murray R. Benedict  
Donald R. G. Cowan  
J. Frederick Dewhurst  
Frederick F. Stephan  
Willard L. Thorp  
Ralph J. Watkins

### Section on Training of Statisticians

J. E. Morton, Chairman  
Sebastian Littauer, Secretary  
R. L. Anderson  
Theodore H. Brown  
Oscar K. Buros  
Mary Elveback  
Paul G. Hoel  
Lester S. Kellogg  
Lloyd Knowler  
Margaret Merrell  
E. B. Mode  
W. A. Neiswanger  
G. Bailey Price  
Douglas E. Scates  
W. Allen Wallis  
W. J. Youden

### Biometrics Section

Margaret Merrell, Chairman  
Max A. Woodbury, Secretary  
Joseph Berkson  
Harold F. Dorn  
Alton S. Householder  
Jerzy Neyman  
Joseph Zubin

### Business Statistics Section

Ralph J. Watkins, Chairman  
Committee to be appointed

## ASSOCIATION REPRESENTATIVES

### Board of Directors of the National Research Bureau of Economic Research

Frederick C. Mills

### Members of the Social Science Research Council

S. S. Wilks  
Willard L. Thorp  
Philip M. Hauser

### Council of the American Association for the Advancement of Science

Merrill M. Flood

### Inter-American Statistical Institute

Forrest Linder

### Joint Committee for the Development of Statistical Application in Engineering and Manufacturing

Churchill Eisenhart  
Walter A. Shewhart

### Inter Society Committee on Science Foundation Legislation

Merrill M. Flood  
Clarence Long

### American Documentation Institute

Donald C. Riley

### Advisory Board of the American Year Book

Margaret Jarman Hagood

### American Standards Association

Z16 Accident Statistics  
Meredith Givens

### Graphic Presentation

Kenneth W. Haemer

### Office Procedure

W. Edwards Deming

# QUESTIONS and ANSWERS

edited by FREDERICK MOSTELLER

**Question 19.** What is the difference between the estimates of gross national product prepared by the National Bureau of Economic Research and the Department of Commerce?

**Answer.** The difference between the NBER and D of C estimates of gross national product results partly from differences of data and methods of estimation and partly from differences in concept. The former are slight and are not considered here. The major conceptual differences are due mainly to the treatment of government services and the factor cost and market price approaches to income measurement. The issues are resolved as outlined below.

Both agencies define gross national product as the market value of goods and services including capital consumption. But net national product (taken by both agencies at market prices) is defined by the NBER to be synonymous with national income; while the D of C net national product is national income (total factor costs) plus indirect business taxes, business transfer payments, and current surplus of government enterprises, minus subsidies. Also, in deriving gross national product the D of C uses accounting measures of capital consumption while the NBER adjusts them for the difference between cost and current reproduction prices. Furthermore, the NBER adds the depletion charges, deducted in deriving national income, but also adjusted to current reproduction prices.

**Question 20.** In an editorial entitled "Peacetime Implications of Operations Research" in the *AMERICAN STATISTICIAN* (December 1948), mention was made of Von Neumann's theory of games, Leontief's input-output concept, Shannon's theory of information, and Wald's theory of decision. Numerous requests have been received like the following: "Will you please inform me of sources where these concepts might be studied further?"

**Answer.** Von Neumann's theory of games is contained in *Theory of Games and Economic Behavior*, John Von Neumann and Oskar Morgenstern, Princeton University Press, 1947 (Revised).

Leontief, Shannon, and Wald have supplied us with bibliographies and comments listed below.

Leontief's input-output concept is contained principally in the following publications (a more complete list of references will be supplied by the Editor on request): Cornfield Evans, and Hoffenberg, "Structure of the American Economy under Full Employment Conditions", *Monthly Labor Review*, March 1947; Leontief, W., "Computational Problems Arising in Connection with Economic Analysis of Industrial Relationships", *Proceedings of a Symposium on Large-Scale Digital Calculating Machinery*, Harvard University Press, 1948, p. 169; Leontief, W., "Output, Employment, Consumption, and Investment", *The Quarterly Journal of Economics*, Vol. LVIII, February 1944; Leontief, W.,

National income is derived by both agencies as the sum of employee compensation, profits of unincorporated business, rents, interest, dividends, and undistributed profits of corporations; but the NBER includes in addition an item of government savings.

In the measurement of national income, the interest and profits items contain the major differences. The D of C estimates of profits, both corporate and noncorporate, are larger because they do not deduct depletion charges and the NBER does. A further difference in the corporate profits item is due to the inclusion of income taxes by the D of C. The NBER takes the item after taxes.

The interest component differs on two counts: first, the D of C excludes interest payments on federal debt whereas the NBER includes them; second, the D of C includes an imputed interest item measuring the value of the services of banks and other financial intermediaries rendered to persons without charge while the NBER includes all long-term interest other than that on government bonds received by nonfinancial corporations.

Discussion of concept can be found in Simon Kuznets' *National Income and Its Composition* (National Bureau of Economic Research, 1941) and in the Department of Commerce's *National Income, Supplement to Survey of Current Business*, July 1947. A detailed review of the D of C estimates appeared in *The Review of Economics and Statistics*, August, 1948.

LILLIAN EPSTEIN

*Structure of American Economy 1919-1929*, Harvard University Press, 1941; Leontief, W., "Wages, Profit and Prices", *The Quarterly Journal of Economics*, Vol. LXI, November 1946.

Shannon's information theory may be found in the following references: Shannon, C. E., "A Mathematical Theory of Communication", *Bell System Technical Journal*, Vol. 27, July, October 1948, pp. 379-423, 623-656; Shannon, C. E., *Proceedings of the Institute of Radio Engineers*, Vol. 37, No. 1, January 1949, pp. 10-21. Shannon states that the first reference is the more general and complete.

The following list of publications deals with Wald's general theory of sequential and non-sequential decision functions: Wald, A., "Contributions to the Theory of Statistical Estimation and Testing Hypotheses", *Annals of Mathematical Statistics*, Vol. 10, December 1939; Wald, A., "Statistical Decision Functions Which Minimize the Maximum Risk", *Annals of Mathematics*, April 1945; Wald, A., "An Essentially Complete Class of Admissible Decision Functions", *Annals of Mathematical Statistics*, December 1947; Wald, A., "Foundations of a General Theory of Sequential Decision Functions", *Econometrica*, October 1947; Part III of *Sequential Analysis*, A. Wald, John Wiley & Sons, Inc., 1947; Brookner, R. J., "On the Choice of One from among Several Hypotheses", *Annals of Mathematical Statistics*, Vol. 16, 1945. Wald states that his paper listed first above is now obsolete, that the *Econometrica* paper contains stronger results than the preceding papers, and that Part III of his book deals with a different approach.

# Area Bias in Map Presentation

by KENNETH W. HAEMER

There are two common causes of area bias in map presentation, and both can be troublesome.

The first of these is the use of the wrong kind of base map. For example, if you will compare the size of Greenland and of the United States, first on a globe and then on a Mercator projection of the world, you will see that in this projection, areas at different latitudes are not comparable and that the farther away from the equator you get the bigger any given square mileage becomes. This type of problem is seldom a serious one unless the map covers a large area such as a continent or hemisphere; but even so, it is a good idea to present area comparisons on a base map that shows equal areas as approximately equal.\*

The second cause of area bias is the use of area presentation when the data are not either specifically or implicitly in terms of area. The popular shaded-area map is frequently misleading for this reason.

Figure 1 shows part of a typical shaded area map. Conditions in each area are shown by a tone (or tone-pattern) proportional to the magnitude of the data. Whether these shadings represent single amount values or ranges of values is of no importance in this discussion.

However, the nature of the data is very important. If the data represent population per square mile (or per any other unit of area), the picture is, in a broad sense, accurate. If the data shown are, say, annual rainfall (or anything

else related directly to area), the picture again is approximately truthful. But if the map shows such information as distribution of national wealth, or value of new construction, or percent of families with radios; the picture is a faulty one and may be seriously misleading.

The trouble, of course, is that the size of the areas has an unwarranted influence on the effect produced. In a state ten times the area of another state, and shaded in the same manner, the data appear to have ten times the magnitude instead of the same magnitude.

Some of the disadvantages of shaded areas can be avoided by using shaded "symbols" (Figure 2). In this method a symbol of fixed size is placed in each area and shaded in the same manner as shaded areas. To some extent, this kind of map has the "small state" problem, since the symbols can be no larger than will fit in (or over) the smallest area division. When using state maps of the U. S. the problem can be partly overcome by extending the symbols into the ocean adjacent to the smaller states, such as Rhode Island and Delaware. However, for many other maps, this trick will not work. The result then becomes a picture of much map and not much symbol, carrying little force or eye appeal. Nevertheless, it does present an accurate impression, which shaded-area maps, however striking, often do not.

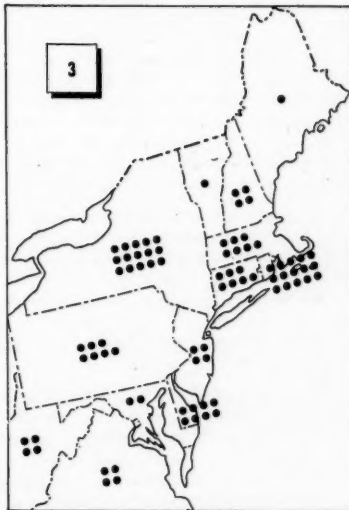
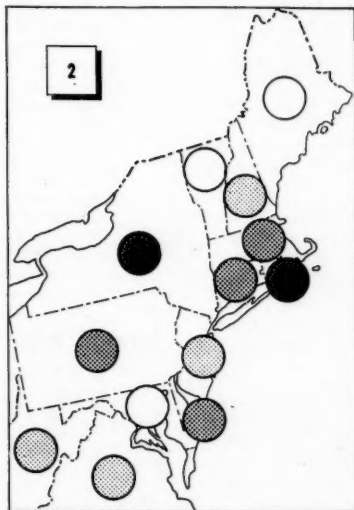
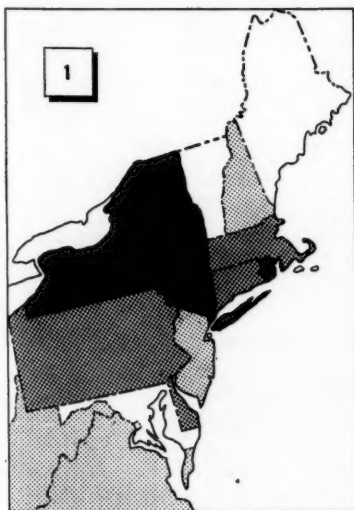
A more direct method of overcoming area bias is to forget all about shading and make each area proportional to the value it presents. Of course this produces a distorted map, and the result, although sometimes very effective, is often so grotesque that the geographical relationships are lost. In addition, the

task of devising one of these misshapen maps is a long and tedious one, and not to be undertaken lightly.

Another, more familiar, method consists of placing a bar, block, disc, or similar device in each area, the size of the device representing the magnitude of the data. This procedure is effective for bringing out small differences from one area to the next, a feature that is absent in shaded maps. But, it has at least one important drawback: some of the symbols usually extend over into one or more adjacent states, creating just enough confusion to be a problem. It is a tantalizing fact that for many kinds of data the largest magnitudes occur in the smaller states.

Still another alternative is provided by the "spot map" technique. (This differs from a density spot map in that the spots are not placed at specific localities but are equally spaced within each area. As shown by figure 3, this map also is more truthful for presenting non-area data than a shaded-area map. However, the same basic problem of how to get large magnitudes into small areas is present here too.

In general, the first problem of area bias—area distortion—can be avoided with relative ease by selecting an equal-area base map. In maps covering an area no larger than the United States, this is seldom a problem anyway. The second problem—area presentation of non-area data—is just as easy to avoid but more difficult to resist, because the alternatives, although more accurate, are very much less striking or attractive. Whatever the choice, it is important to realize the shortcomings of each method and not to choose haphazardly.



\* An excellent reference book for this problem: "Elements of Map Projection" (Special Publication No. 68) is available from the U. S. Department of Commerce, Coast and Geodetic Survey. Price: About \$1.00.

## UNITED NATIONS STATISTICAL NEWS

### Statistical education and training

The Economic and Social Council has recommended "that the Secretary-General, in collaboration with the United Nations Educational, Scientific and Cultural Organization, other interested specialized agencies, the International Statistical Institute, and other appropriate international organizations, arrange for (a) a survey of needs for education and training in statistics and the formulation of an international programme to meet these needs; (b) a report on the means by which such a programme may be put into effect."

### Nomenclature of geographic terms

A Committee has been formed within the Secretariat of the United Nations to work on the standardization of geographical names in all the official languages. The Committee consists of a member of the Population and Vital Statistics Section of the Statistical Office of the United Nations, a member of the Languages Division of the Library Service, and a cartographer.

### UN study of indexes of industrial production

The Statistical Office of the United Nations has begun work on a study of indexes of industrial production to cover such matters as scope, classification, basis of weighting, method of averaging, and base period. The study is intended to provide, among other things, for the comparability of industrial production indexes with other economic series and for greater comparability among the indexes for various countries.

The Statistical Office is at present assembling material for the study and has requested the national statistical offices of different countries to assist in this phase of the undertaking. The Division of Statistical Standards of the Bureau of the Budget has been requested to supply material relating to the United States experience in this field. With the collaboration of the Board of Governors of the Federal Reserve System, the Department of Commerce, and other agencies known to have a direct interest in the matter, the Division is assembling documents, technical memoranda, and other material to be submitted to the Statistical Office.

Although the documents now being assembled relate primarily to the scope and content of and methods used in compiling the Federal Reserve Index of Industrial Production, it is hoped to include technical papers on a number of more general aspects of the subject, such as comments on the League of Nations recommendations and specific suggestions as to what aspects a technical study should include.

The Statistical Office of the United Nations, following examination of materials submitted by different countries, expects to assemble a group of experts at Lake Success to formulate draft recommendations on the subject for consideration by the Statistical Commission and for circulation to individual countries for comment.

### Fulbright Professor Needed in Burma

The Conference Board of Associated Research Councils in Washington advises that there is urgent need for a Professor of Statistics in the University of Rangoon to carry on the work of Dr. Ernest L. Inwood. The duties are to teach graduate students and to serve as a consultant on statistical problems to Burmese leaders. Research experience and familiarity with national income problems are definitely essential.

This vacancy arises under the Fulbright Act which provides for a system of cultural interchange between American and foreign students and teachers, financed through the proceeds of surplus property sales abroad. Accordingly, the salary will be payable in Burmese money and the applicant, if approved, must make his own arrangements for currency conversion.

### Air Force Reserve Needs Statisticians

The Comptroller's Office of the Department of the Air Force advises us that it is in need of qualified statisticians to serve as reserve officers in grades ranging from Second Lieutenants to Colonels. The reserve pool of statisticians and other professionals being built up in the Comptroller's Office will be called to active duty only in the event of declaration of a national emergency. The major responsibilities are in the application of statistical methods to administrative problems and production control.

The minimum educational requirement is a college degree and one year of practical experience, or alternatively, an M. A. degree. Age limits are 21 to 57. Women are eligible for grades below that of Colonel provided they do not have dependents under 18. Aliens and past or present conscientious objectors will not be considered.

### New BAE Journal

*AGRICULTURAL ECONOMICS RESEARCH* is to be issued quarterly by the Bureau of Agricultural Economics. The first number carries the date-line January 1949. The magazine is to be a research publication for professional readers. Members of the staff of the Bureau in Washington and in the field will contribute as well as individuals who are working on projects either cooperatively or under contract with the Bureau.

It will publish articles that report on the results or findings of research carried forward within the Bureau. These articles may be in the nature of interim reports on work in progress or statements that actually terminate the projects. It will publish articles on new research methods or techniques that are being developed as well as discussions of old techniques that are in regular use. It will occasionally publish articles on methods or techniques which are designed to elicit or encourage discussions at the technical level. Other articles will relate to new or expanding areas of research or statistical fact-gathering.

### Foreign Wage Data Collected

Statistics on wages and earnings in various occupations for foreign countries are being collected by the Office of Foreign Labor Conditions, of which Miss Faith Williams is chief, in the Bureau of Labor Statistics of the U. S. Department of Labor. In the first report of the project, data are given for Great Britain, Norway, Finland, Denmark, The Netherlands, France, Switzerland, Czechoslovakia, Italy, and Japan.

# CHAPTER NOTES

## ALBANY

Albany reports nomination of David M. Schneider for the two-year term and Charles Armstrong for the one-year term as District Representatives. Chapter President Ethel Metzendorf and Max Weinstein were named to represent the Chapter on the District Committee.

## BOSTON

Frederick Mosteller, of the Laboratory of Social Relations at Harvard University, addressed the March dinner meeting of the Chapter. Dr. Mosteller gave an informal talk on the theory of games and the statistical aspects of psychology and testing, and problems confronting the Question and Answer panel of *The American Statistician*, of which he is editor.

## CENTRAL ILLINOIS

The Central Illinois Chapter held three successful meetings during the spring quarter. On March 21, Milton Friedman, Economics Professor at the University of Chicago, spoke on "Forecasting Business Fluctuations." On April 11, Dr. Lee J. Cronbach, Associate Professor of Education, University of Illinois, addressed an evening meeting on "Statistical Problems in Psychological Testing". Professor William J. Madow of the University of Illinois concluded the Chapter program of activities with a talk on May 9 on "Recent Developments of Ideas in Statistics".

### Officers:

President, Donald W. Paden, Department of Economics; Vice-President, J. W. Peters, Department of Mathematics; Secretary-Treasurer, Robert Ferber, Bureau of Business Research.

At the last luncheon meeting of the group Mr. Leonid Hurwicz spoke on the "Uses of Statistics and Econometrics in Economic Analysis".

## CENTRAL INDIANA

At the January 20 meeting Professor George Starr, Director of Indiana Bureau of Business Research, discussed the general business index. Professor Fred Witney of the Indiana University Department of Economics forecast trends for the consumer price index. Mr. Dwight Kelley of Indiana Employment Security Division discussed possible trends in total nonagricultural employment in Indiana. Dr. Donald Paarlberg of the Department of Agriculture, Purdue University, made the predictions in the farm income field.

An "I predict" session comprised a

portion of the meeting. Cards were provided for members to enter their predictions for December 1949 in the fields discussed by the speakers.

## CENTRAL NEW JERSEY

A Sociological Study of Fertility was the topic of the April 11 meeting of the Trenton Chapter. The speaker was Professor Paul K. Hatt of Princeton, sociologist and Office of Population Research associate. Dr. Hatt discussed the field survey methods and problems encountered in the demographic analysis of some 6,000 Puerto Rico families completed last year.

On April 26, Miss Besse B. Day, Principal Statistician at the Annapolis Naval Engineering Experiment Station discussed the use of statistics in the VT Fuze Program. A. L. Robertson, an electronics engineer at Johns Hopkins, discussed the VT (Proximity) Fuze Documentary Film.

## CHICAGO

The Chicago Chapter held a dinner meeting on April 20 at which the eminent Czechoslovak authority, Dr. Emil Schoenbaum, gave a nonmathematical paper on "Statistical Problems in Social Insurance". Dr. Schoenbaum is a Professor of Applied Mathematics at King Charles University in Prague and is the author of a standard work on social insurance which includes consideration of the impact of demographic trend and variations in interest rate.

The popular luncheon meetings of the Chapter, which have won so much praise from other ASA groups, continued during May. On the 10th, Professor W. Allen Wallis of the University of Chicago and a newly elected ASA Fellow spoke on *Sequential Analysis—Tests and Estimation*, devoting special emphasis to the use of this technique in estimating population parameters. On the 12th, Warren Cordell of A. C. Nielson, the designer of Nielson area samples, spoke on *The Use of Area Samples in Market Research*.

The Chapter reported a membership of 283 on April 11. Within the Chapter organization, Walter Hoadley was appointed to serve with George Morgan on the North Central District Committee. Director Frank Annunzio of the Illinois Department of Labor organized an advisory board to the *Illinois Labor Bulletin* of labor, industrial, business and technical groups. The ASA Chapter is represented on this Board by Joseph H. White.

Walter Hoadley, Howard Jones and Guenther Baumgart, all Past Presidents, have been chosen as the Nominating Committee for 1949-50. The Constitution and By-Laws Committee, chaired by

Guenther Baumgart, has completed a draft document for the Chapter which is in conformity with the new ASA Constitution. The draft will be reviewed by the Board of Directors and then submitted to the membership.

The Personnel and Placement Committee of the Chicago Chapter has had a very successful season in fitting round pegs into round holes. They now have a pool of applicants ranging from bright young graduates to thoroughly experienced people in various fields of statistics. A campaign is now planned to encourage their contacts with prospective employers.

## CONNECTICUT

The Connecticut Chapter held its meeting on April 6. Professor Gertrude M. Cox, Director of the Institute of Statistics, University of North Carolina spoke on Current Research at the Institute.

## DENVER

Harold Davis, of the Bureau of Reclamation and 1st Vice-President of the Chapter, arranged for Joseph M. Barrett, Assistant Planning Engineer in the Bureau's South Platte District Office, to speak at the February 10 meeting on the "Economic Aspects of the Potential Blue—South Platte Project". The project is a multiple purpose plan based upon the importation of water from the Colorado River Basin to the Denver area and north.

The March meeting was held on the 10th and was addressed by Dr. Walter Orr Roberts, Superintendent of the Harvard-University of Colorado High Altitude Observatory. Dr. Roberts spoke on solar research.

## OKLAHOMA CITY

At the April meeting of the Chapter, Dwight S. Williams of the Bureau of Business Research of the University of Oklahoma analyzed estimation of county income and presented a map of county per capita income dispersion within the state. It was announced that the June meeting will discuss the controversial Kinsey Report.

The March session was devoted to a discussion of statistical methods as a control device in Air Force activities. The speaker was Professor Francis R. Cella of the University.

In February, Charles S. Wallace of the City Board of Education discussed safety education problems and school enrollment forecasting. The Chapter is considering setting up an auxiliary for spouses—of either sex—deserted during statistical sessions.

## CHAPTER NOTES

### PHILADELPHIA

The January 21 meeting was devoted to a discussion of the work of the Joint Committee on the Economic Report. A member of the staff of the J. C. E. R. led the discussion which focused particularly on its two publications: "Economic Indicators" and "Statistical Gaps".

The meeting was designed to serve two purposes. First, to give us a better understanding of the objectives and functioning of the J. C. E. R. and second, to give them the benefit of our opinions and suggestions on the problems discussed in "Statistical Gaps" and on the philosophy, content, and presentation of "Economic Indicators".

A dinner meeting was held on February 18. Morris B. Ullman, Statistician, U. S. Bureau of the Census, discussed the Statistical Abstract program with emphasis on a forthcoming publication—"Historical Statistics of the U. S."—its purpose, uses, misuses, gaps, etc.

"Economic Stabilizers, Destabilizers and Prospects" were discussed at the annual forecasting meeting held on March 25. The speaker was Dr. C. R. Whittlesey, Professor of Finance and Economics, University of Pennsylvania.

### SACRAMENTO

The following were elected as officers of the Sacramento Chapter for the year ending June 30, 1949: O. B. Bailey, President; Ronald Beattie, Vice President; Richard Morgan, Secretary-Treasurer; James Fuller, Editor; Marvin Blanchard, Librarian; and Vida Ryan, P. E. Keller and Ralph Currie, Board Members.

### ST. LOUIS

The new and active St. Louis Chapter devoted its April meeting to "Statistical Problems in Recent St. Louis Salary Surveys". The speaker was J. K. Gerdel, Assistant Professor of Commerce and Finance at Washington University. The previous month featured a round table on the use of tabulating machines in statistics. Participants were F. P. Wortley and Anne Hennigen of I. B. M. and J. E. Wilmont and Dean Gardner of Statistical Tabulating Co. The February session concentrated on economic activity forecasting. Frederick Deming and Harry J. O'Neill predicted no change and 5% to 10% declines respectively for 1949 as against 1948 employment levels.

### THE UNIVERSITY OF TEXAS

The Austin, Texas, Chapter of the American Statistical Association, in luncheon meeting on the campus of the

University of Texas, January 19, 1949, had as guest speaker Mr. Sam Weiss, Chief, Employment Division, U. S. Bureau of Labor Statistics, and Washington representative of the American Statistical Association. Mr. Weiss spoke on the current employment statistics program of the B. L. S. Also a guest was Mr. Dudley E. Young, Employment Analyst in the regional B. L. S. office in Atlanta, Georgia.

Local officers elected were: President, Mr. V. C. Childs, Agricultural Statistician in Charge, Austin Office, Bureau of Agricultural Economics, U. S. Department of Agriculture; Vice President, Mr. Francis May, Statistician, Office of the President, University of Texas; Secretary, Miss Elsie Watters, Supervisor of Research, Bureau of Business Research, University of Texas. Miss Stella Traweck was appointed correspondent for the chapter. Dr. John R. Stockton, Professor of Business Statistics and Chairman of the Department of Business Services, College of Business Administration, University of Texas, was nominated for district representative of the American Statistical Association, South Central District.

### WASHINGTON STATISTICAL SOCIETY

The "Economic Outlook for 1949" was the question discussed by Leon H. Keyserling, Vice-Chairman of the Council of Economic Advisers, and George C. Smith, Research Economist of the U. S. Chamber of Commerce, at a dinner given by the Washington Statistical Society Tuesday evening, January 11. Dr. Smith said that most economic indicators pointed to a continued high level of economic activity with a moderate downturn in prices during 1949. Dr. Keyserling indicated that he opposed economic forecasting, but agreed generally as to coming trends. They differed sharply over government economic policy.

Dr. Keyserling described three present or portending "maldistributions" in the economy. They were: the wide range in income distribution, the incipient imbalance between prices for farm products and industrial goods, and the size of profits in relation to employee income. Selective remedial measures were needed in these areas while a National Prosperity Budget was proposed to prevent extreme cyclical movements. The Budget would estimate our economic capacities and outline production goals.

"Plans for the 1950 Censuses of Population and Agriculture" was the subject of a joint meeting of the Washington Statistical Society and the District chapter of the American Sociological Society on February 14. Some of the plans for carrying out the Censuses, results of experimental work done, and expected results were discussed by J. C. Capt, Morris B. Hansen, Howard G. Brunsmann, and Ray Hurler.

## NEWS about MEMBERS

**Robert Axel**, formerly Assistant Director of the Bureau of Research and Statistics, New York State Department of Social Welfare, has been promoted to the position of Associate Director of the Bureau.

**T. Ledgard Blakeman**, formerly Planning Engineer of the New Jersey Department of Economic Development, is now Executive Director of the Detroit Metropolitan Area Regional Planning Commission.

**Marguerite F. Hall** is now Chief Consultant on Public Health Statistics in the New Jersey State Department of Health.

**Professor P. C. Mahalonobis** has been appointed to represent India at the United Nations Conference on Conservation and the Utilization of Natural Resources at Lake Success August 17 to September 6. Professor Mahalonobis, who is one of India's leading statisticians, also represents his country on the U. N. Statistical Commissions. He is founder and editor of *Sankhya*, an Indian journal of statistics, and was general secretary of the 1947 Indian Science Congress.

**Erich Arnold Schultz**, Director, Division of Research and Statistics, Arizona State Department of Public Welfare, has been granted a four month leave of absence to participate in the Visiting Expert Program in the Research and Statistics Division, ESS, GH, SCAP, Tokyo, Japan.

**J. Leonard Schatz**, formerly Market Analyst for The Spectator is now associated with the Penn Fruit Company, a supermarket chain in Philadelphia.

**Leo Younger**, formerly Statistician-Analyst with the U. S. Economics Corporation, is now employed as Statistician in Charge of Sales and Market Research at the Bulova Watch Co., New York City.

ec-  
nd  
nt  
to  
he

n-  
rt-  
ow  
o-  
m-

n-  
he  
th.

en  
he  
er-  
ral  
to  
ho  
ms.  
N  
ler  
ur-  
re-  
ess.

ion  
ate  
een  
nce  
ert  
tics  
an.

ket  
sso-  
/, a

an-  
Cor-  
ian  
rch  
ork